Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein

Model No: YSA-300

User Manual

Version: V1.00

Software Version: V1.00

Hardware Version: V1.00

Yu-Shing Biotech., Ltd

Declaration

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Now, enjoy the convenience of Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein if you obey the rules.

Package List

Every product has following objects. They should be checked carefully when you open the package for the first time. Yu-Shing Biotech., Ltd. and the dealers will replace relative articles for free if they are found different from the ones in the following table.

Name	Piece
Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein	1
The CD for YSA-300	1
USB connector	1
12V Power adapter	1
12V Power adapter connector	1

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1 Introduction

The Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein with three wavelengths: 230nm, 260nm, 280nm, is specially designed to analyze the concentration and pure of nucleic acid(DNA/RNA), and can measure 0.3～2μL samples with high accuracy and reproducibility. The samples can be measured by dropping them directly onto the lower measurement pedestal without absorption cell and also can be taken back after measuring if necessary. This instrument don't need warm-up after start, and is operated simply and quickly with reporting directly the concentrations of samples. The concentration range of samples measured by Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein is 50 times larger than that measured by the general spectrophotometer. In addition, the instrument is small (outline size: 24cm×22cm×14cm) and lightweight (net weight: 2.35kg).

Principle

The calculation of sample concentration is based on the Beer-Lambert law,

$$A = \varepsilon\, b\, c$$

Where A is the measured absorbance, ε is the molar absorption coefficient, b is the path length, and c is the concentration.

Range of application

The Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein can measure:

Nucleic acid: the concentration and purity of DS-DNA, SS-DNA and RNA.

Protein: the concentration of the protein，protein(1Abs = 1mg/mL), BSA, IgG and lysozyme;

Other solution samples: other solution samples which have absorption at 230nm, 260nm or 280nm.

Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein may be controlled by the computer or by the instrument panel. Then, the next introduction content will be divided into two parts: part A and part B. We will introduce the Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein controlled by computer in part A, and controlled by the instrument panel in part B.

Part A：controlled by computer

2 Installation

2.1 Port connection

Connect the USB port of the Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein to the USB port of computer with the USB connector.
Connect the adapter to the power plug with the power adapter connector.
Plug the plug of the adapter into the jack of the Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein.

2.2 System requirements

Software requirements: Microsoft Windows 2000 and XP or better operation system
Microsoft Office 2000 or higher office software
Adobe Reader 7.0 or higher version

Hardware requirements: CPU: Intel Pentium III 800MHz or above
EMS memory: a minimum of 256MB
Hard disk: with a minimum of 50MB of free disk space

2.3 Installing the software

Put the YSA-300 software CD into the CD drive. Double-click the CD catalogue, you will find “USB Driver” folder and “YSA-300” file. Please copy them to your computer.
The “YSA-300” file can be used directly and needn’t to be installed. You can create a shortcut on the desk as below:

2.4 Installing the drivers

After the instrument is connected correctly with the computer, switch on the power by pressing the switch，then the instrument starts self-checking. When the self-checking finished，Windows will automatically scan the new hardware and tip: Find new hardware.
Windows will automatically open hardware installation guide. Now select “Install from a list or specific location (Advanced)”

Click “Next” and enter driver options dialog box. Choose “Search for the best driver in these locations” and “include this location in the search”. Click “Browse” to look for the “CyUSB” file under the “USB Driver” folder you just put.

Click “Next”, Windows system will automatically install the selected divers. When the installation is finished.

Click “OK” to finish the hardware installation.
Now, Windows will tip you that the instrument is installed successfully and can be used.

We can check whether the hardware is installed correctly by browse the “Properties” of “My computer”. Rightclick “My computer” →“Properties” →“Hardware” →“Device Manager” →“Universal Serial Bus controllers”. The hardware is installed correctly if there is “Cypress EZ-USB PX2LP – EEPROM missing”, or please install again after link the instrument and switch on the power again.

3 General operation

3.1 Sample size requirements

Nucleic acids: 0.5～2μL

Proteins: 0.5～2μL

Other solutions: 0.5～2μL

3.2 Measurement procedures

3.2.1 Start

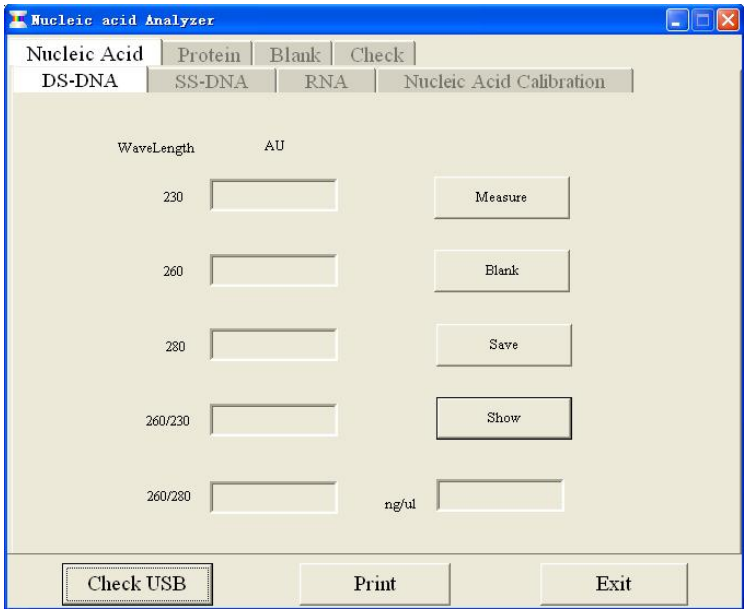
(1) Connect correctly Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein to the computer.

(2) Connect correctly Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein to the power adapter.

(3) Switch on the power by pressing the switch and the instrument starts self-checking.

(4) Double-click the YSA-300 icon on the desk to start the software.

The work interface will open as below.



Now you can measure the sample from here.

3.2.2 Blank

(1) You must choose the correct measurement type from the measurement type select area based on your samples before measuring.

(2) A blank must be measured before measuring the samples or after reselecting a measurement type each time.

(3) Check if the measurement pedestals are clean, or please wipe the pedestals with clear absorbent paper. It will seriously impact the measurement result.

(4) Then open the sampling arm and drop 0.5～2μL solvent onto the lower measurement pedestal.

(5) Close the sampling arm and click the “Blank” button. The sample column is automatically formed as below and the software will automatically measure and store the result of the blank.

(6) Open the sampling arm and wipe the blank solvent from the measurement pedestals with clear absorbent paper.

3.2.3 Measurement

(1) Open the sampling arm and drop 0.5～2μL sample onto the lower measurement pedestal.
(2) Close the sampling arm and click the “Measure” button, and the software will automatically measure the sample.
(3) The result of the sample will appear in the work interface in seconds (A230, A260, A280, A260/A230, A260/A280 and concentration).
If you aren’t sure about the result, the reasons may be that the sample column isn’t formed or the blank doesn’t work well. Please check whether the sample column is formed and measure it again, or measure the blank again and then measure the sample again.
(5) Open the sampling arm and wipe the sample from the measurement pedestals with clear absorbent paper after each time a sample measured.

3.2.4 Output

Click the “Show” button after the samples measured to output the result data of the samples by excel.
In addition, you can click the “Save” button to set or change the saving location of the result data before measurement samples. If you don’t set the saving location, the result data will be saved at the default location.

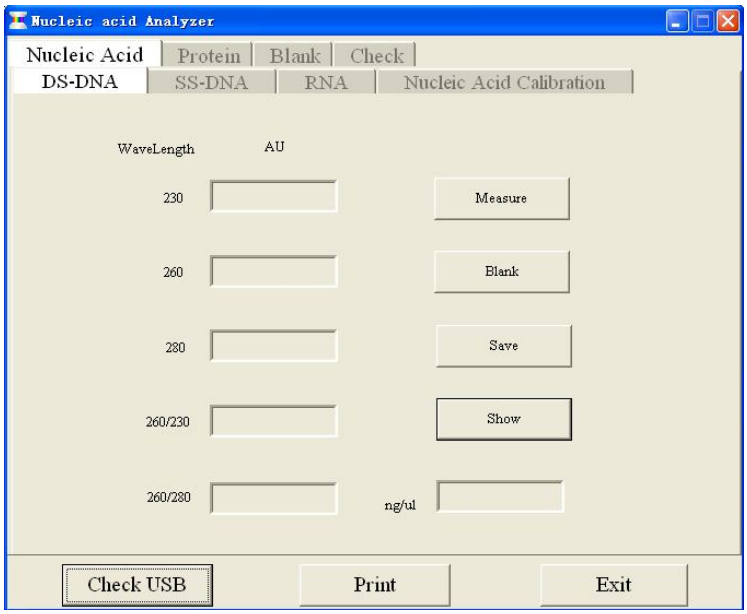
3.2.5 Print

Click the “Print” button after a sample measured to print the result data of the

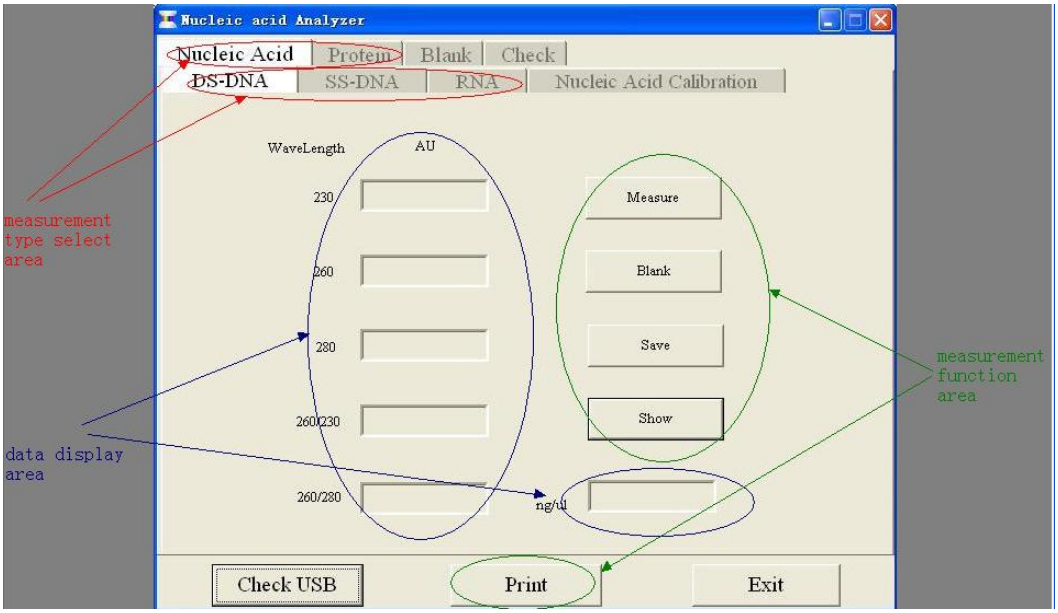
sample if you want to print the result. The printer will print the result data of the sample just measured each time.

4 Functions of work interface

Open the YSA-300 software and enter the work interface of the Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein as below:



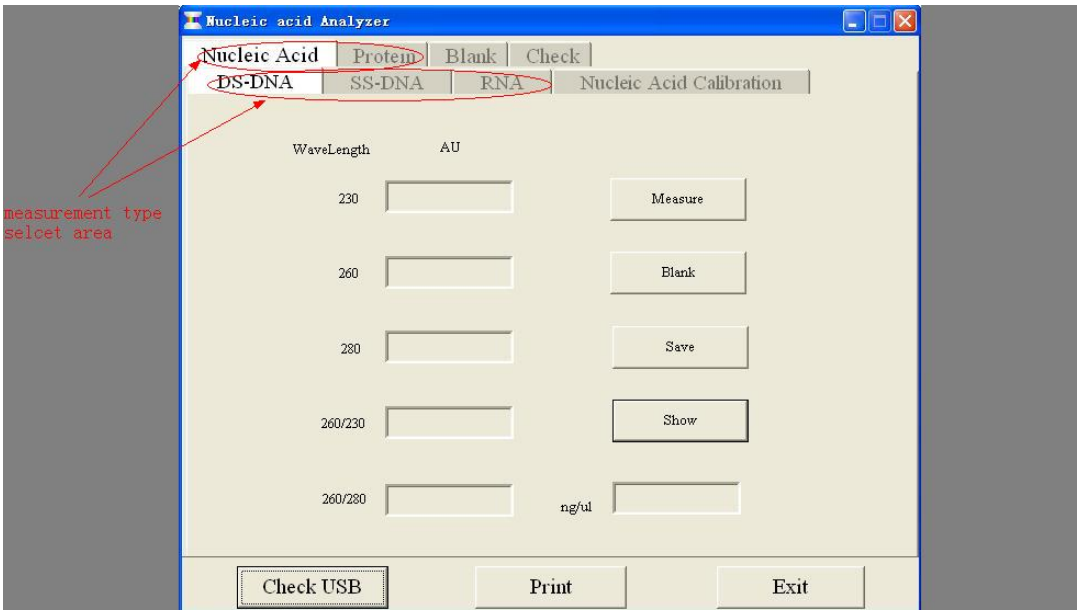
For easy introduction, the work interface can be divided into three parts: measurement type select area, data display area and measurement function area.



4.1 Measurement type select area

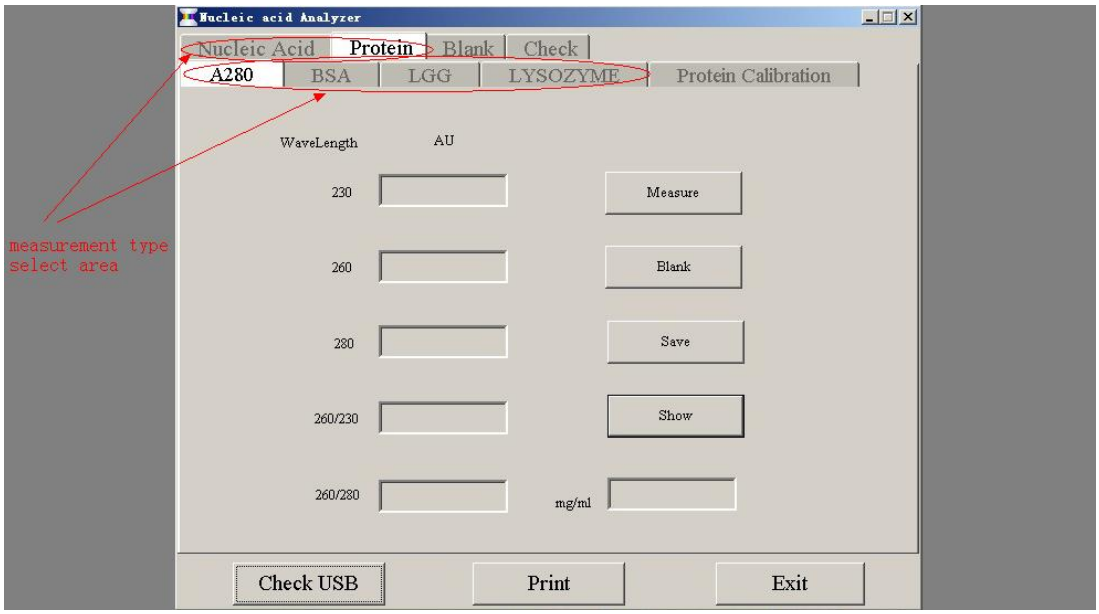
There are two big items in the measurement type select area: “Nucleic Acid” and “Protein”. The user can select the correct measurement type from here

based on the samples.



Nucleic Acid: This type is designed for measuring the concentration and purity of nucleic acid. The user can select the “DS-DNA”, “SS-DNA” or “RNA” under the “Nucleic Acid” to measure the double-stranded DNA, the single-stranded DNA and RNA respectively.

Protein: This type is designed for measuring the concentration of protein. The user can select “A280”, “BSA”, “IGG” or “LYSOZYME”.

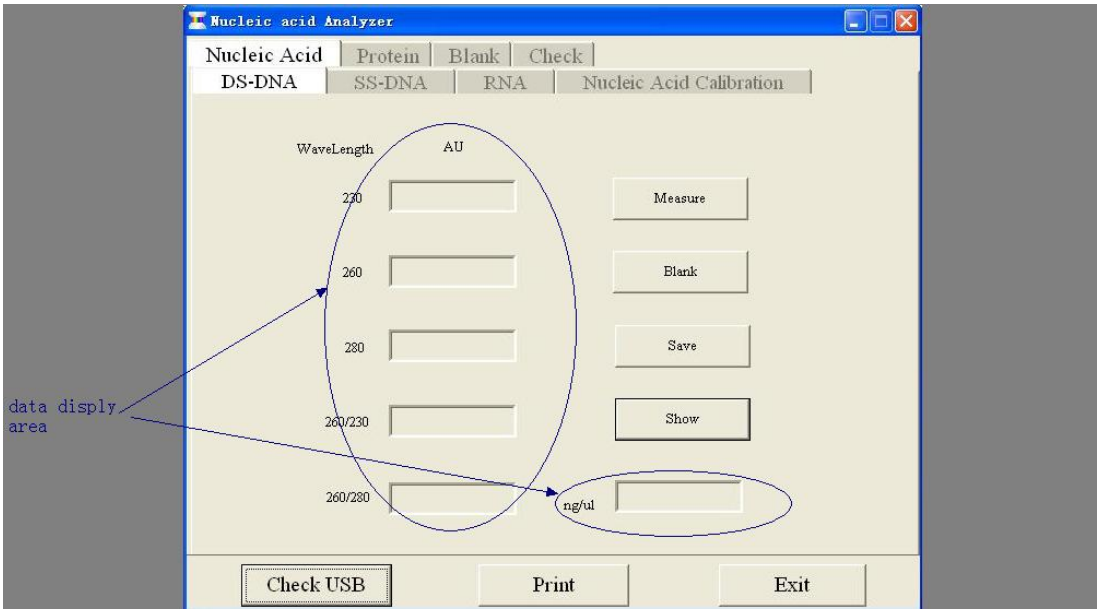


“A280” is designed for measuring the protein solution which produce an absorbance at 280nm of 1.0A (path length: 10mm) at the concentration of 1 mg/ml.

“BSA”, “IGG” and “LYSOZYME” are designed for measuring the BSA, IgG and Lysozyme.

4.2 Data display area

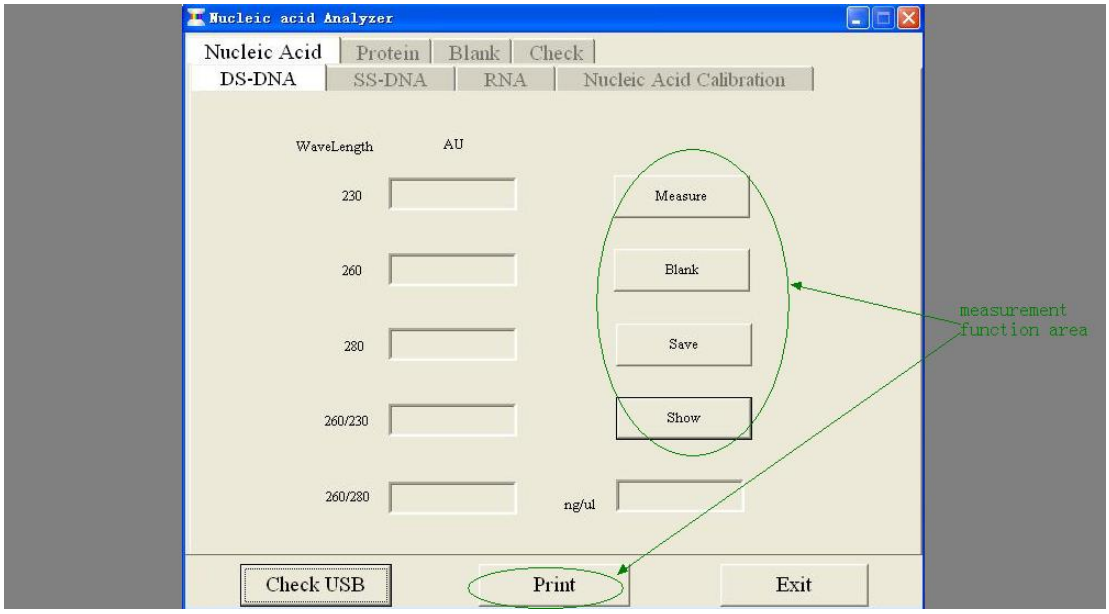
This area displays A230nm, A260nm, A280, A260/A230, A260/A280 and the concentration of sample as below:



Sample concentration in ng/μL is for nucleic acid and in mg/mL for protein when a sample is measured.

4.3 Measurement function area

There are five buttons in the measurement function area: “Measure”, “Blank”, “Save”, “Show” and “Print” as below:



The “Blank” button is used to measure and store the blank which must be measured before measuring the samples.

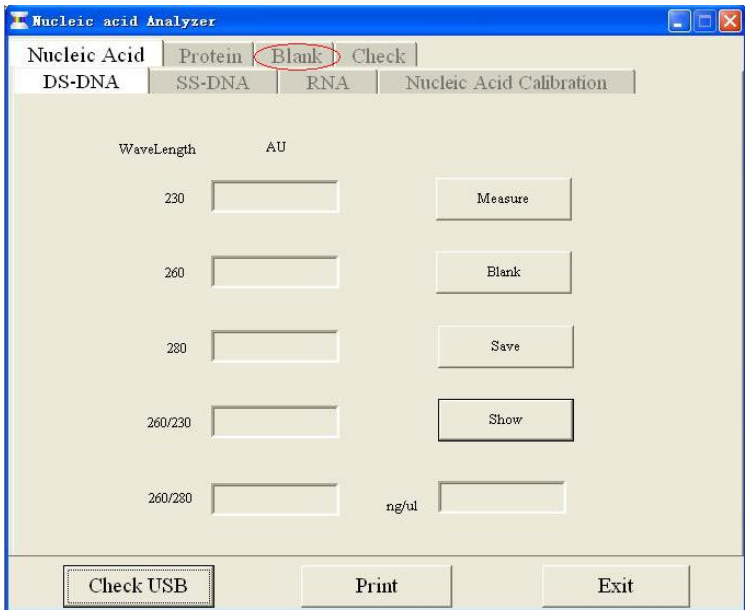
The “Measure” button is used to measure the samples after measured a blank.

The “Save” button is used to set or change the saving location of the result data before measurement samples.

The “Show” button is used to output the result data of the samples by excel.

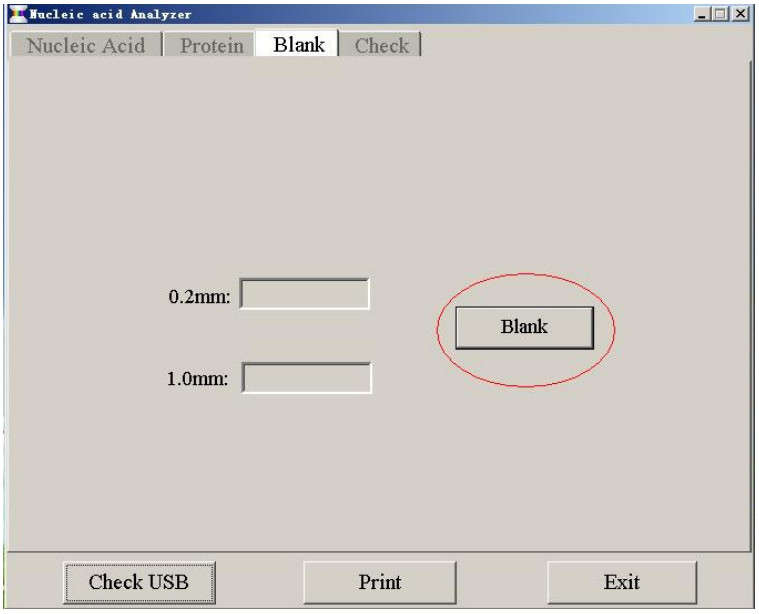
The “Print” button is used to print the result data of the sample just measured each time.

In addition, there is a “Blank” button at the top of the work interface.

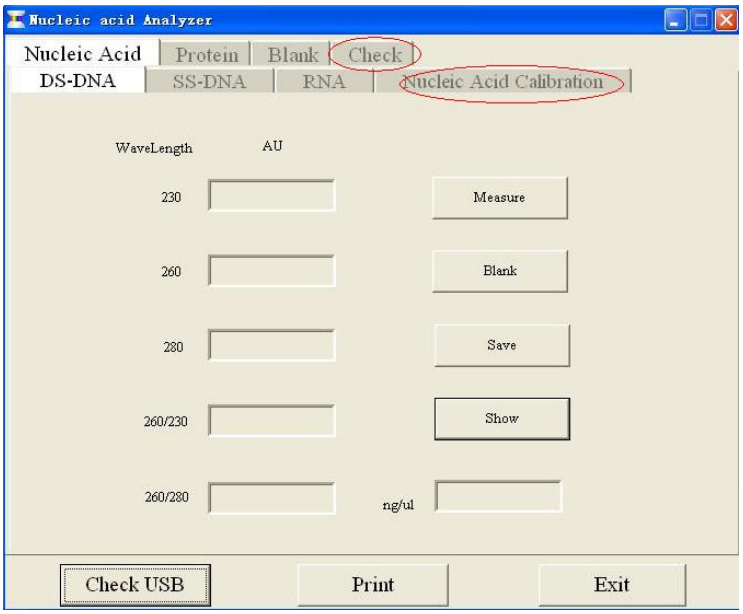


Click the “Blank” button and enter the interface below. From here the user can check the light intension. Click the “Blank” button in the middle of the interface,

the light intension will appear in the 0.2mm bar and the 1.0mm bar, the values should between 40,000 and 100,000.



The “Check” button and the “Nucleic Acid Calibration” (or “Protein Calibration”) button are designed for technician debugging.



Click the “Exit” button or the red “close” button, the work interface will be closed.

5 Measurement

5.1 Nucleic acid

The Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein with three wavelengths: 230nm, 260nm, 280nm, is specially designed to analyze the concentration and pure of nucleic acid (DNA/RNA), because nucleic acids have the highest absorption peak at 260nm, and the concentration of nucleic acids can be calculated and reported by the software based on the Beer-Lambert law, and the ratio of absorbance at 260nm and 280nm and the ratio of absorbance at 260nm and 230nm can assess the purity of nucleic acids.

5.1.1 Sample size requirements

Recommended volume:0.5～2μL

5.1.2 Measurement range

DS-DNA: 10～3750ng/μL

SS-DNA: 10～2500ng/μL

RNA: 10～3000ng/μL

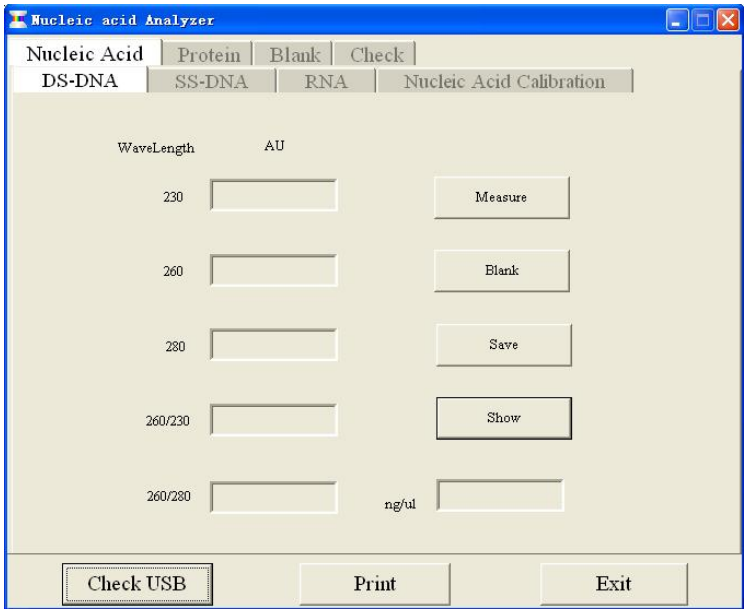
Typical reproducibility（SD= ng/μL；CV= %）：

Sample range 10～100ng/μL： ±5ng/μL

Sample range ＞100ng/μL： ±5%

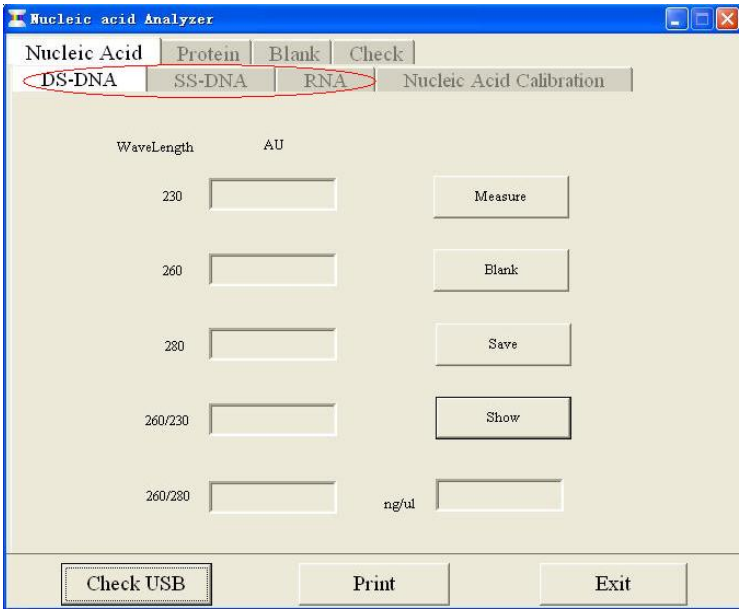
5.1.3 Work interface

Open the YSA-300 software and the default interface is the nucleic acids measurement interface as below:



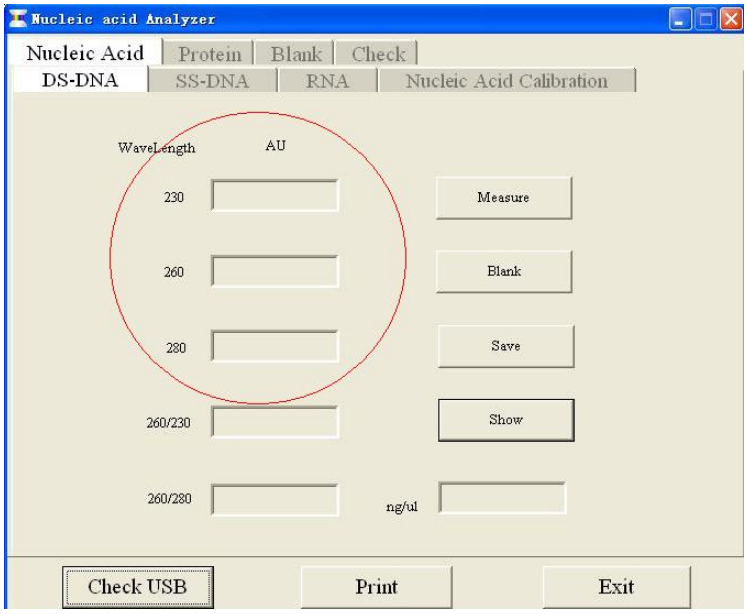
Measurement type

There are three measurement types: “DS-DNA”, “SS-DNA” and “RNA” for measuring double-stranded DNA, single-stranded DNA and RNA respectively.



Wavelength and absorbance

There are three wavelengths: 230nm, 260nm, 280nm, and the corresponding AU value is the absorbance at 230nm, 26nm, and 280nm respectively (path length: 10mm).



260/280

The ratio of absorbance at 260nm and 280nm can assess the purity of nucleic acids. Generally the ratio is about 1.8 for relative pure DNA and about 2.0 for relative pure RNA. A lower ratio indicates that the DNA or RNA may be contaminated by other things.

260/230

The ratio of absorbance at 260nm and 230nm can also assess the purity of nucleic acids.

Concentration

The concentration value of nucleic acids will appear in the ng/μL bar after measured a sample each time, and the unit is ng/μL.

5.1.4 Measurement procedures

For detailed measurement procedures, please see (3.2)

(1) Select the right measurement type from “DS-DNA”, “SS-DNA” and “RNA”. For example, select “DS-DNA” for measuring the double-stranded DNA samples.

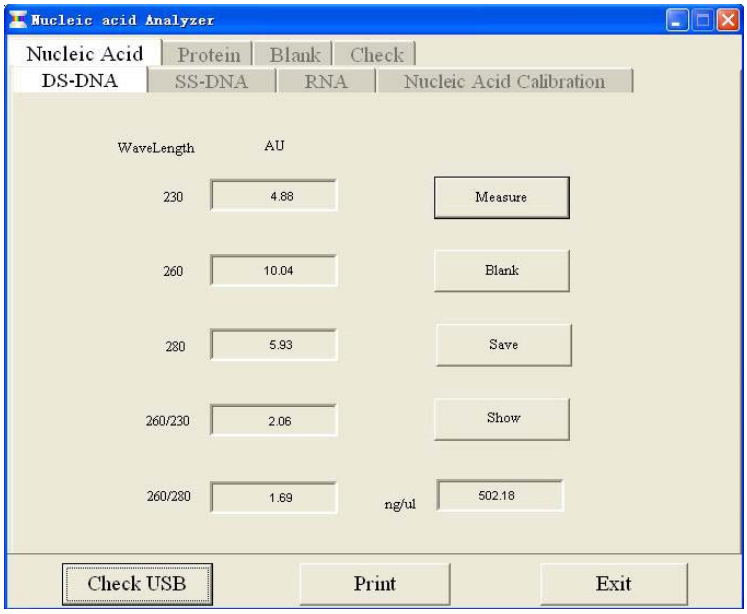
(2) At first, measure a blank using the solvent by dropping it onto the lower measurement pedestal and clicking the “Blank” button to measure and store the blank.

(3) Wipe the solvent from the measurement pedestals with clear absorbent

paper.

(4) Then drop sample onto the lower measurement pedestal and click the “measure” button to measure the sample.

(5) The result of the sample will appear in the work interface in seconds as below:



(6) Open the sampling arm and wipe the sample from the measurement pedestals with clear absorbent paper after each time a sample measured.

(7) When all the double-stranded DNA samples measurement finished, click the “Show” button to output the results by Excel.

(8) Click the “Print” button after a samples measured to print the result data of the sample if you want to print the result.

5.2 Protein

The Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein can measure the concentration of proteins. Because proteins have the highest absorption peak at 280nm, the concentration of proteins can be calculated and reported by the software based on the Beer-Lambert law.

5.2.1 Sample size requirements

Recommended volume: 0.5～2μL

5.2.2 Measurement range

BSA: 0.5～110mg/mL

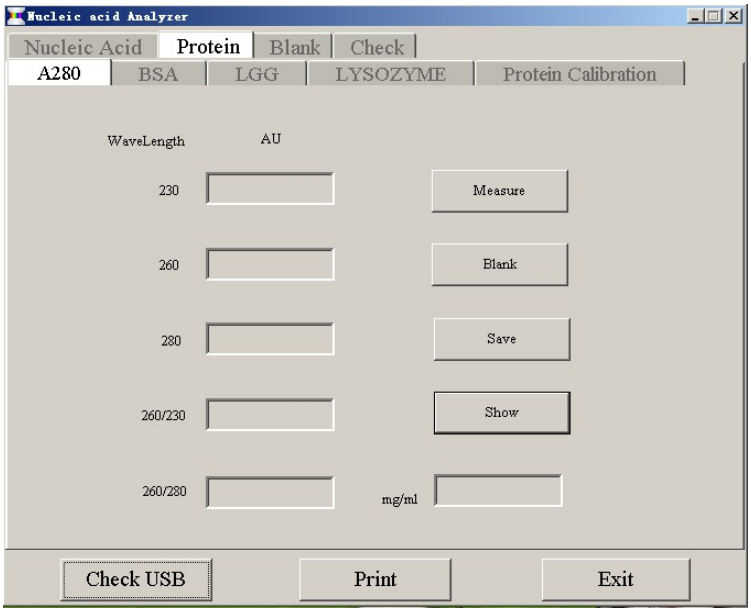
Typical reproducibility（SD= mg/mL；CV= %）:

Sample range 0.5～10mg/mL： ±0.5mg/mL

Sample range ＞10mg/mL： ±5%

5.2.3 Work interface

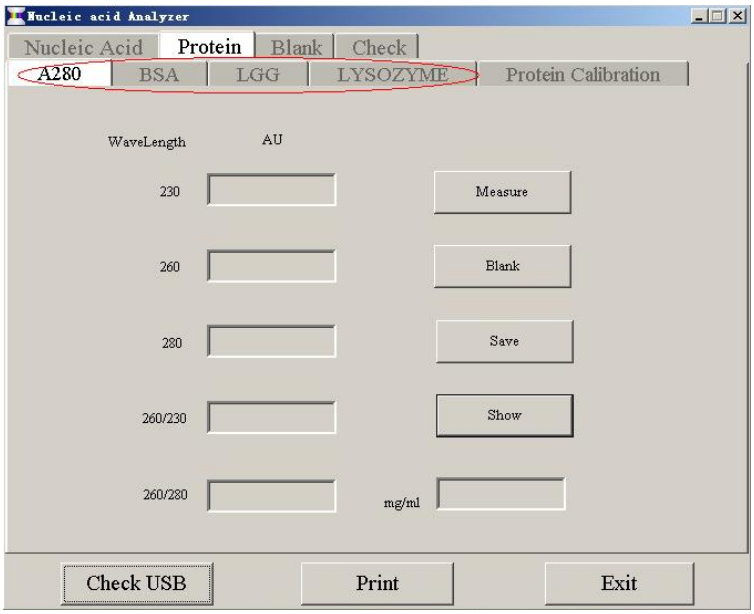
Click the “Protein” button in the measurement type select area and enter the protein measurement interface as below:



Measurement type

There are four measurement types: “A280”, “BSA”, “IGG” and “LYSOZYME”

for measuring protein at 280nm.



“A280” is designed for measuring the protein solution which produce an absorbance at 280nm of 1.0A (path length: 10mm) at the concentration of 1 mg/ml.

“BSA”, “IGG” and “LYSOZYME” are designed for measuring the bovine serum albumin (BSA), immunoglobulin G (IgG) and Lysozyme respectively.

Wavelength and absorbance

We mainly consider the absorbance at 280nm, i.e. AU value at 280nm (path length: 10mm).

Concentration

The concentration value of proteins will appear in the mg/mL bar after measuring a sample each time, and the unit is mg/mL.

5.2.4 Measurement procedures

For detailed measurement procedures, please see (3.2).

(1) Select the right measurement type from “A280”, “BSA”, “IGG” and “LYSOZYME”. For example, select “BSA” for measuring the bovine serum albumin samples.

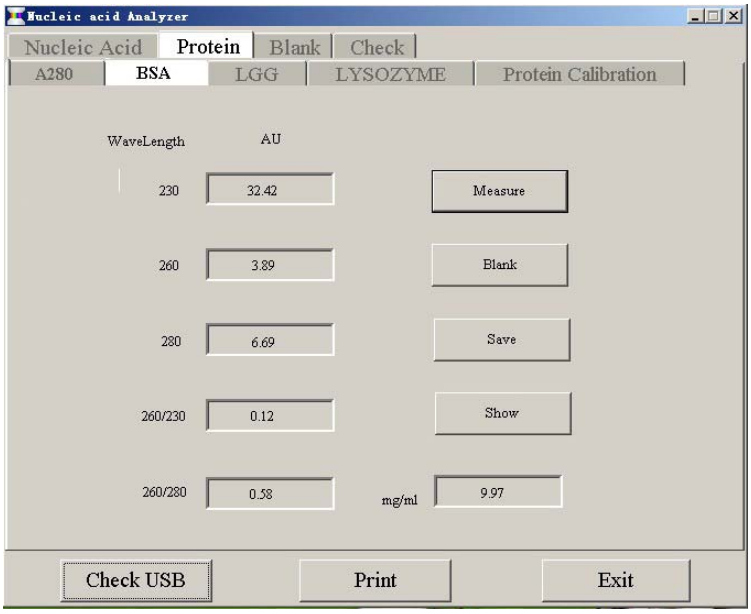
(2) At first, measure a blank using the solvent by dropping it onto the lower measurement pedestal and clicking “Blank” button to measure and store the blank.

(3) Wipe the solvent from the measurement pedestals with clear absorbent

paper.

(4) Then drop sample onto the lower measurement pedestal and click the “measure” button to measure the sample.

(5) The result of the sample will appear in the work interface in seconds as below:



(6) Open the sampling arm and wipe the sample from the measurement pedestals with clear absorbent paper after each time a sample measured.

(7) When all the BSA samples measurement finished, click the “Show Report” button to output the results by Excel.

(8) Click the “Print” button after a samples measured to print the result data of the sample if you want to print the result.

Part B: controlled by the instrument panel

The Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein can be controlled directly by the instrument panel without computer.

6 General operation

6.1 Sample size requirements

Nucleic acids: 0.5～2μL

Proteins: 0.5～2μL

Other solutions: 0.5～2μL

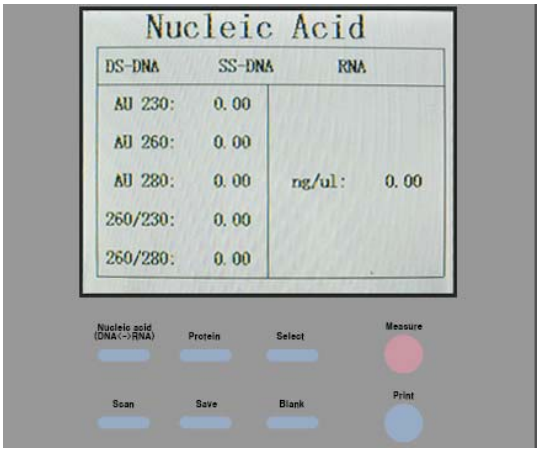
6.2 Measurement procedures

6.2.1 Start

(1) Connect correctly Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein to the power adapter.

(2) Switch on the power by pressing the switch and the instrument starts self-checking.

When the self-checking finished, the LCD on the instrument panel display as below:



Now you can measure the sample from here.

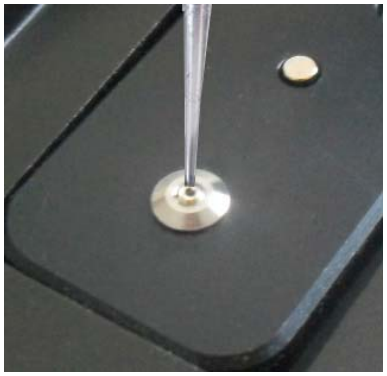
6.2.2 Blank

(1) You must choose the correct measurement type by pressing the “Nucleic Acid” button, “Protein” button or “Select” button based on your samples before measuring.

(2) A blank must be measured before measuring the samples or after reselecting a measurement type each time.

(3) Check if the measurement pedestals are clean, or please wipe the pedestals with clear absorbent paper. It will seriously impact the measurement result.

(4) Then open the sampling arm and drop 0.5～2μL solvent onto the lower measurement pedestal.



(5) Close the sampling arm and press the “Blank” button. The sample column is automatically formed as below and the software will automatically measure and store the result of the blank.

(6) Open the sampling arm and wipe the blank solvent from the measurement pedestals with clear absorbent paper.

6.2.3 Measurement

(1) Open the sampling arm and drop 0.5～2μL sample onto the lower measurement pedestal.
(2) Close the sampling arm and press the “Measure” button, and the software will automatically measure the sample.
(3) The result of the sample will appear on the LCD in seconds (A230, A260, A280, A260/A230, A260/A280 and concentration).
If you aren’t sure about the result, the reasons may be that the sample column isn’t formed or the blank doesn’t work well. Please check whether the sample column is formed and measure it again, or measure the blank again and then measure the sample again.
(5) Open the sampling arm and wipe the sample from the measurement pedestals with clear absorbent paper after each time a sample measured.

6.2.4 Save and scan

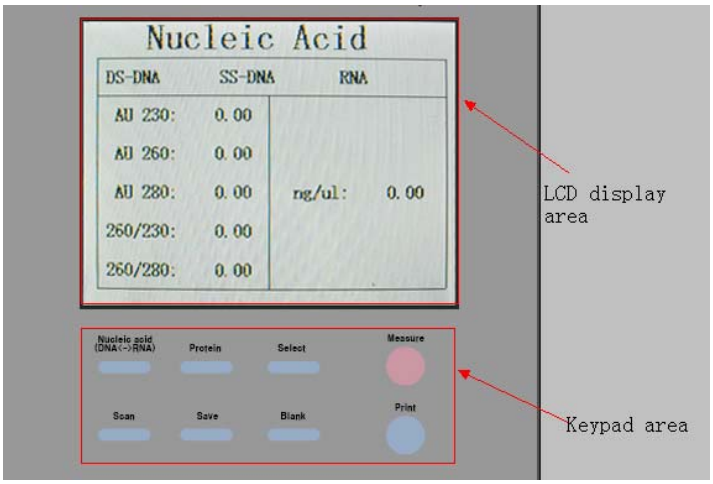
Press the “Save” button after measured a sample, you can save the result data of the sample. The instrument can save automatically the result data of the first ten samples, and it can save the result data of sample more than ten if you press the “Save” button after a sample measured. It can at most save the result data of 30 samples.
Press the “Scan” button, you can scan the result data of the samples.

6.2.5 Print

Press the “Print” button after a sample is measured to print the result data of the sample if you want to print the result. The printer will print the result data of the sample just measured each time.

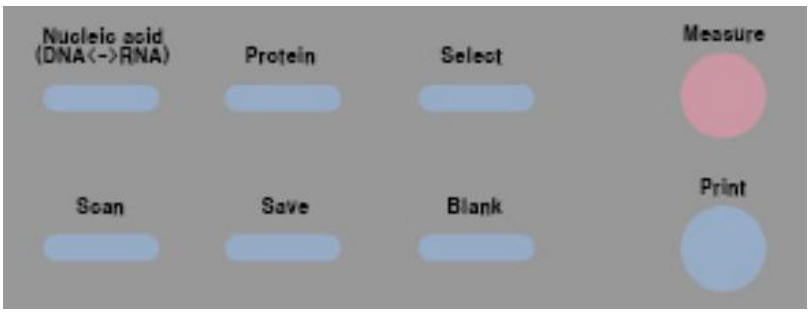
7 Introduction of instrument panel

For easy introduction, the instrument panel can be divided into two parts: LCD display area and keypad area.



7.1 Keypad area

There are 8 buttons on the keypad area: “Nucleic acid”, “Protein”, “Select”, “Measure”, “Scan”, “Save”, “Blank” and “Print”.



“Nucleic Acid” button: Press this button, the user can select nucleic acid measure type including “DS-DNA”, “SS-DNA” or “RNA”.

“Protein” button: Press this button, the user can select protein measure type including “A280”, “BSA”, “IGG” or “LYSOZYME”.

“Select” button: This button is used to select “DS-DNA”, “SS-DNA” or “RNA” under Nucleic acid measure type, or select “A280”, “BSA”, “IGG” or “LYSOZYME” under Protein measure type.

“Blank” button: The “Blank” button is used to measure and store the blank which must be measured before measuring the samples.

“Measure” button: The “Measure” button is used to measure the samples

after measured a blank.

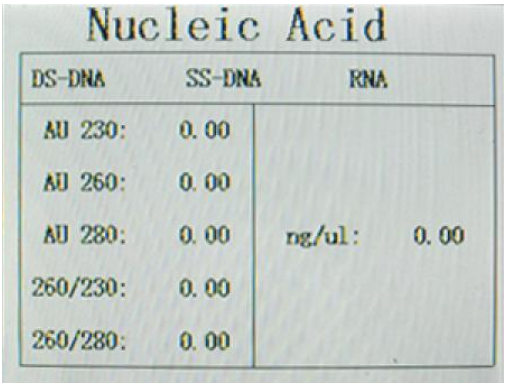
“Scan” button: The “Scan” button is used to scan the result data of samples measured.

“Save” button: The “Save” button is used to save the result data of samples. The instrument can save automatically the result data of the first ten samples, and it can save the result data of sample more than ten if you press this button after a sample measured. It can at most save the result data of 30 samples.

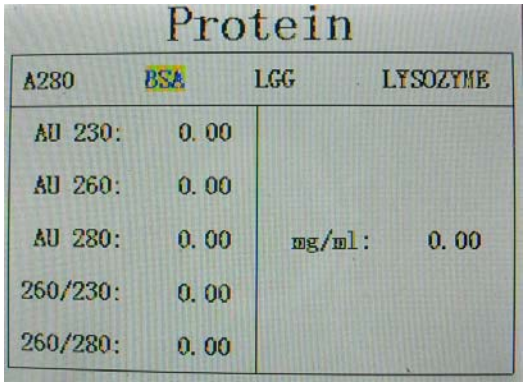
“Print” button: The “Print” button is used to print the result data of the sample just measured each time.

7.2 LCD display area

There are three parts on the LCD: measure types on the top, the absorbance and ratio on the left and the concentration on the right.

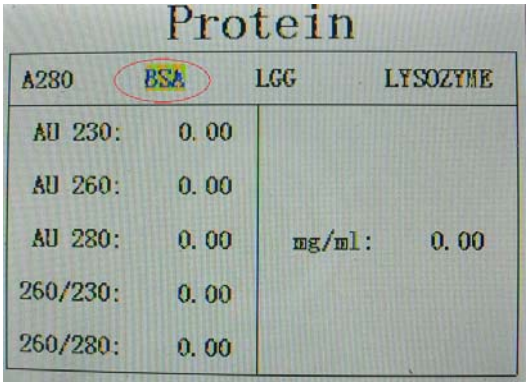


There two measurement types: “Nucleic Acid” and “Protein”. And the “Nucleic Acid” includes “DS-DNA”, “SS-DNA” or “RNA” under the “Nucleic Acid” to measure the double-stranded DNA, the single-stranded DNA and RNA respectively. The “Protein” includes “A280”, “BSA”, “IGG” or “LYSOZYME”.



The user can change the “Nucleic Acid” or “Protein” type through pressing the “Nucleic Acid” button or “Protein” button, and select “DS-DNA”, “SS-DNA”,

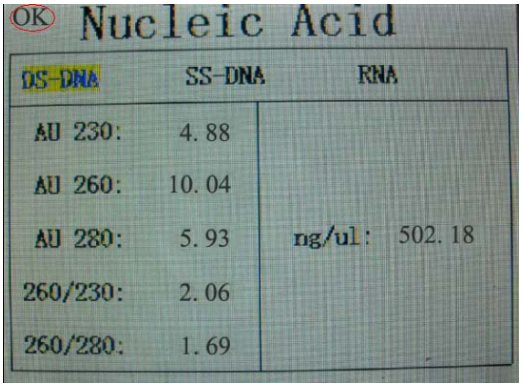
"RNA" or "A280", "BSA", "IGG", "LYSOZYME" through pressing the "Select" button. The letters will be painted yellow when it is selected.



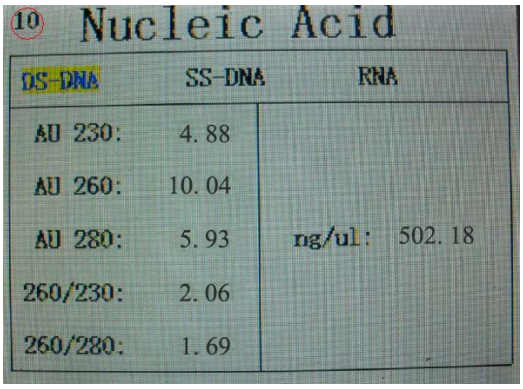
The left of the LCD displays A230nm, A260nm, A280, A260/A230 and A260/A280, and the values are all "0.00" before a sample is measured

The right of the LCD displays the concentration of samples, and the value is "0.00" before a sample is measured.

When press the "Save" button after measured a sample, you can save the result data of the sample, and the words of "OK" will flash on the upper left corner of the LCD.



The user can scan the result data of the samples when press the "Scan" button, and the serial number of the sample will appear on the upper left corner of the LCD.



8 Measurement

8.1 Nucleic acid

The Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein with three wavelengths: 230nm, 260nm, 280nm, is specially designed to analyze the concentration and pure of nucleic acid (DNA/RNA), because nucleic acids have the highest absorption peak at 260nm, and the concentration of nucleic acids can be calculated and reported by the software based on the Beer-Lambert law, and the ratio of absorbance at 260nm and 280nm and the ratio of absorbance at 260nm and 230nm can assess the purity of nucleic acids.

8.1.1 Sample size requirements

Recommended volume:0.5～2μL

8.1.2 Measurement range

DS-DNA: 10～3750ng/μL

SS-DNA: 10～2500ng/μL

RNA: 10～3000ng/μL

Typical reproducibility（SD= ng/μL；CV= %）：

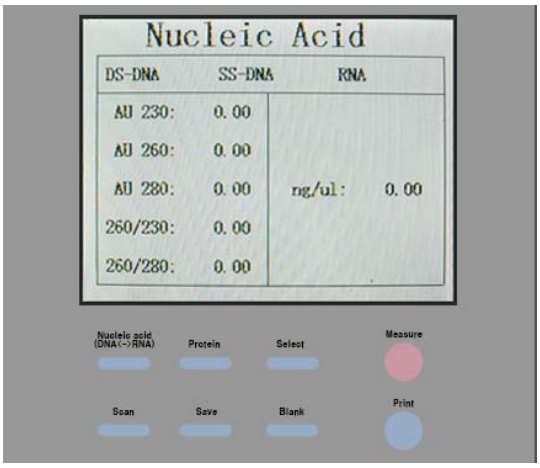
Sample range 10～100ng/μL： ±5ng/μL

Sample range ＞100ng/μL： ±5%

5.1.3 Work interface

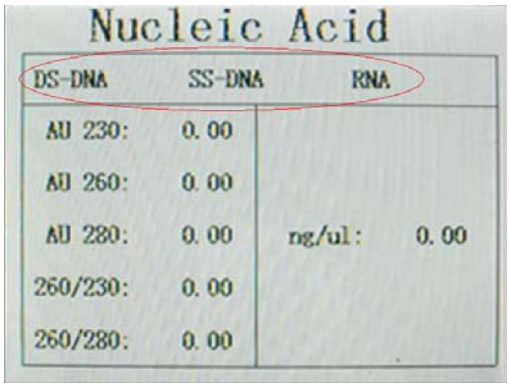
Switch on the power by pressing the switch and the instrument starts self-checking.

When the self-checking finished, the LCD on the instrument panel display as below:



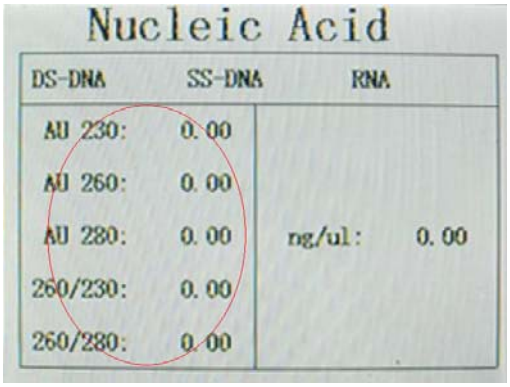
Measurement type

There are three measurement types: “DS-DNA”, “SS-DNA” and “RNA” for measuring double-stranded DNA, single-stranded DNA and RNA respectively.



Wavelength and absorbance

There are three wavelengths: 230nm, 260nm, 280nm, and the corresponding AU value is the absorbance at 230nm, 26nm, and 280nm respectively (path length: 10mm).



260/280

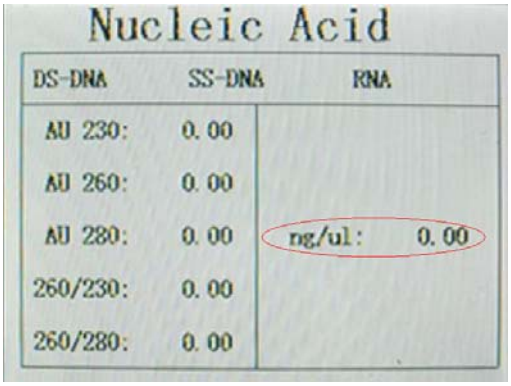
The ratio of absorbance at 260nm and 280nm can assess the purity of nucleic acids. Generally the ratio is about 1.8 for relative pure DNA and about 2.0 for relative pure RNA. A lower ratio indicates that the DNA or RNA may be contaminated by other things.

260/230

The ratio of absorbance at 260nm and 230nm can also assess the purity of nucleic acids.

Concentration

The concentration value of nucleic acids will appear in the ng/μL bar after measured a sample each time, and the unit is ng/μL.



8.1.4 Measurement procedures

For detailed measurement procedures, please see (6.2)

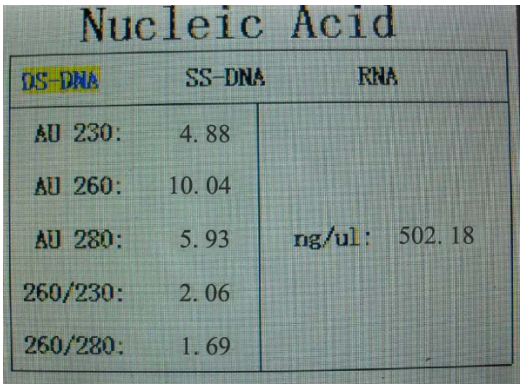
(1) Select the right measurement type from “DS-DNA”, “SS-DNA” and “RNA”. For example, select “DS-DNA” for measuring the double-stranded DNA samples.

(2) At first, measure a blank using the solvent by dropping it onto the lower measurement pedestal and press the “Blank” button to measure and store the blank.

(3) Wipe the solvent from the measurement pedestals with clear absorbent paper.

(4) Then drop sample onto the lower measurement pedestal and press the “measure” button to measure the sample.

(5) The result of the sample will appear on the LCD in seconds as below:



(6) Open the sampling arm and wipe the sample from the measurement pedestals with clear absorbent paper after each time a sample measured.

(7) Click the “Print” button after a samples measured to print the result data of the sample if you want to print the result.

8.2 Protein

The Micro-Volume UV Spectrophotometer for Nucleic Acid and Protein can measure the concentration of proteins. Because proteins have the highest absorption peak at 280nm, the concentration of proteins can be calculated and reported by the software based on the Beer-Lambert law.

8.2.1 Sample size requirements

Recommended volume: 0.5～2μL

8.2.2 Measurement range

BSA: 0.5～110mg/mL

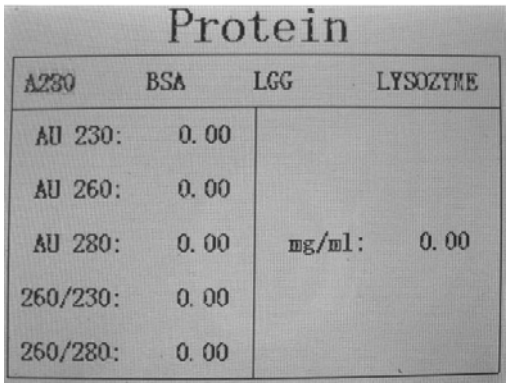
Typical reproducibility（SD= mg/mL；CV= %）:

Sample range 0.5～10mg/mL： ±0.5mg/mL

Sample range ＞10mg/mL： ±5%

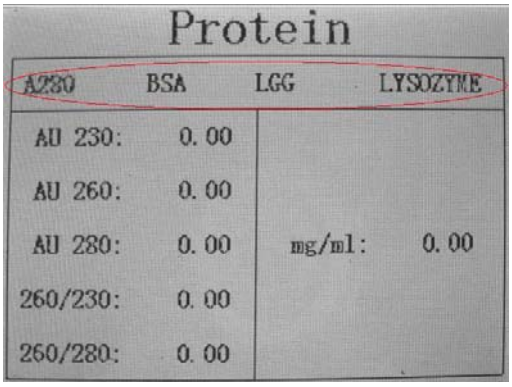
8.2.3 Work interface

Press the “Protein” button to enter the protein measurement interface as below:



Measurement type

There are four measurement types: “A280”, “BSA”, “IGG” and “LYSOZYME” for measuring protein at 280nm.

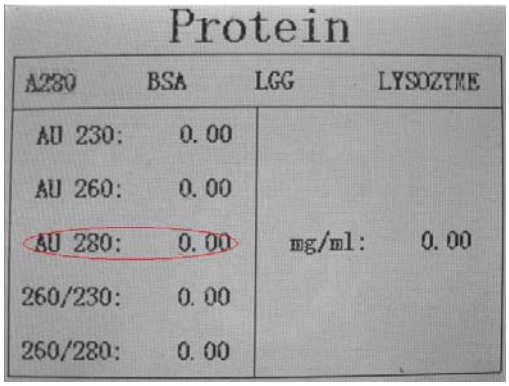


“A280” is designed for measuring the protein solution which produce an absorbance at 280nm of 1.0A (path length: 10mm) at the concentration of 1 mg/ml.

“BSA”, “IGG” and “LYSOZYME” are designed for measuring the bovine serum albumin (BSA), immunoglobulin G (IgG) and Lysozyme respectively.

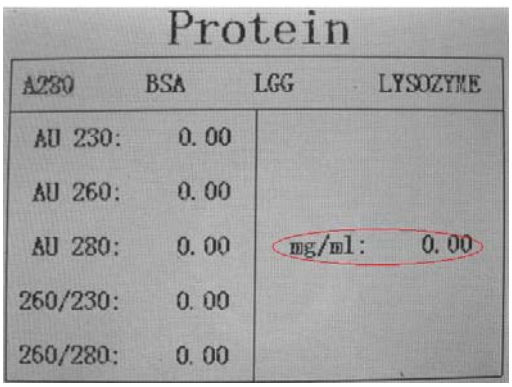
Wavelength and absorbance

We mainly consider the absorbance at 280nm, i.e. AU value at 280nm (path length: 10mm).



Concentration

The concentration value of proteins will appear in the mg/mL bar after measuring a sample each time, and the unit is mg/mL.



8.2.4 Measurement procedures

For detailed measurement procedures, please see (6.2).

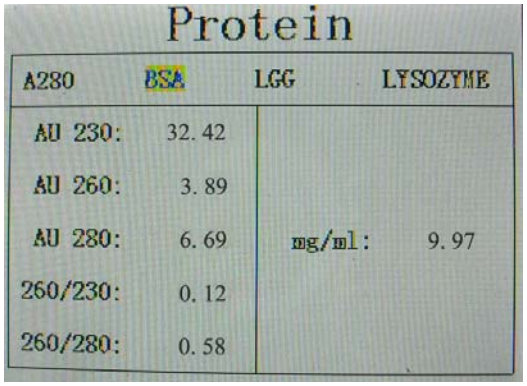
(1) Select the right measurement type from “A280”, “BSA”, “IGG” and “LYSOZYME”. For example, select “BSA” for measuring the bovine serum albumin samples.

(2) At first, measure a blank using the solvent by dropping it onto the lower measurement pedestal and press the “Blank” button to measure and store the blank.

(3) Wipe the solvent from the measurement pedestals with clear absorbent paper.

(4) Then drop sample onto the lower measurement pedestal and press the “measure” button to measure the sample.

(5) The result of the sample will appear in the work interface in seconds as below:



(6) Open the sampling arm and wipe the sample from the measurement pedestals with clear absorbent paper after each time a sample measured.

(7) Click the “Print” button after a samples measured to print the result data of the sample if you want to print the result.